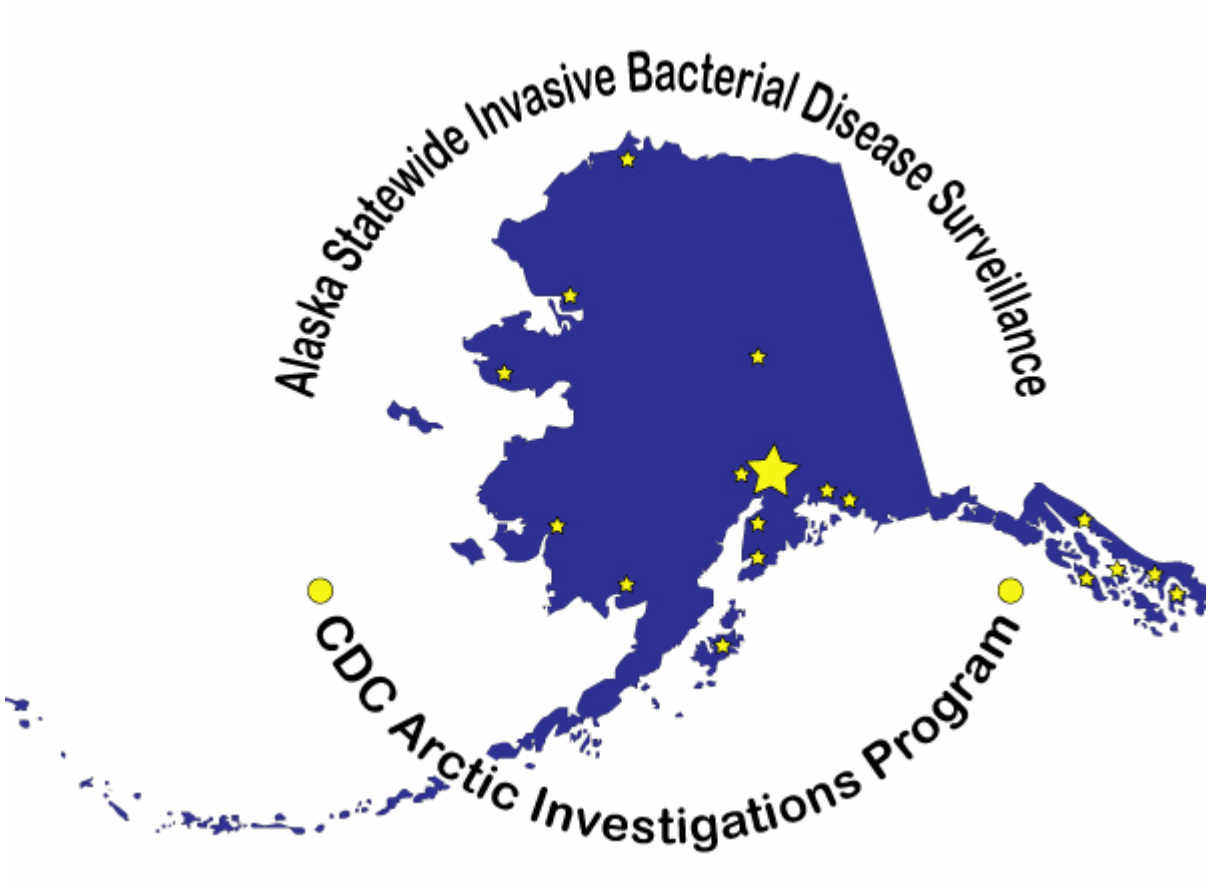

Surveillance of Invasive Bacterial Disease in Alaska, 2004

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Alaska Statewide Invasive Bacterial Disease

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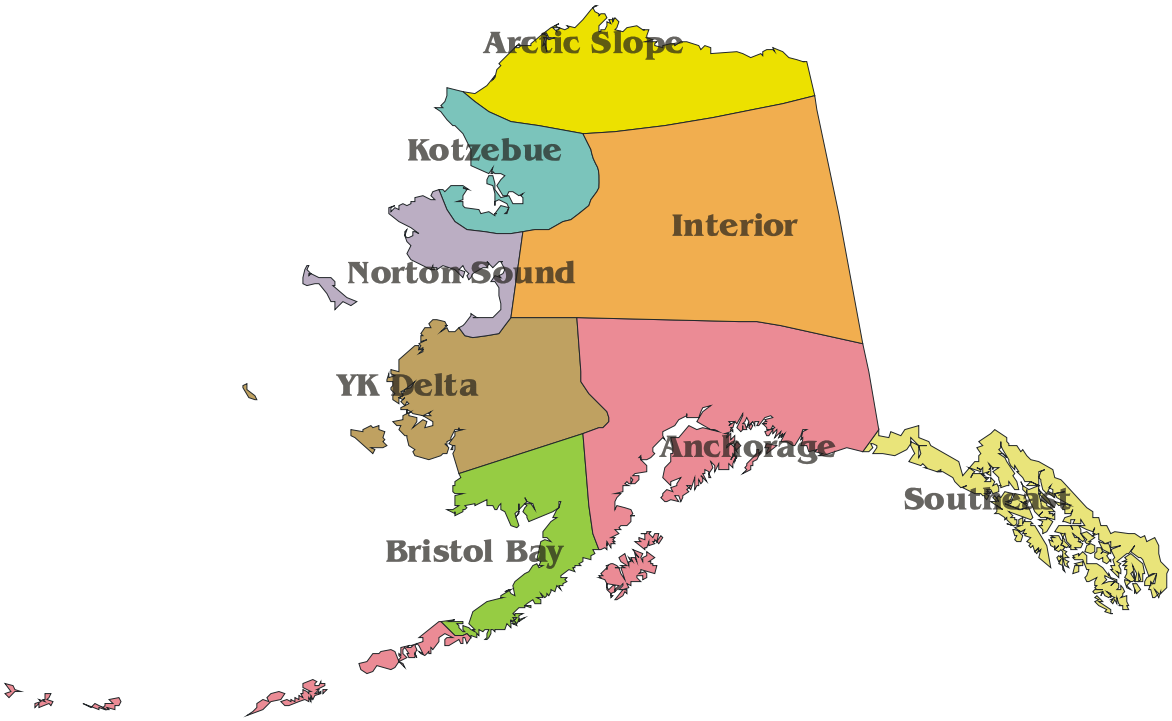
Summary

The Centers for Disease Control and Prevention's Arctic Investigations Program (AIP) in Anchorage, Alaska, maintains a statewide surveillance system for invasive diseases caused by *Streptococcus pneumoniae*, *Haemophilus influenzae, Neisseria meningitidis*, and groups A and B streptococci. Laboratories throughout the state are requested to send to AIP any isolates of these organisms recovered from a blood culture, CSF, or other normally sterile site. Isolate identification is confirmed and, when appropriate, serotyped and tested for antimicrobial susceptibility. The objectives of this system are to provide information on disease rates within the state, monitor the emergence of antimicrobial resistance, and to monitor the effectiveness of implemented vaccine programs, such as the 23-valent pneumococcal polysaccharide vaccine, the 7-valent pneumococcal conjugate vaccine and *Haemophilus influenzae* type b vaccines.

Figure 1: Invasive Bacterial Disease Surveillance Regions – Alaska, 2004



In 2004, the total numbers of cases of invasive disease caused by these organisms reported to AIP were 100 *S. pneumoniae*, 12 *H. influenzae*, 5 *N. meningitidis*, 26 group A *Strep* and 34 group B *Strep*. Alaska Native populations had higher rates of disease than non-Native populations in all invasive disease except those caused by *N. meningitidis*. Rates of invasive pneumococcal disease and *H. influenzae* were highest in the YK Delta. Rates for each organism by region are presented in the following table.

Table 1: Surveillance Organisms Reported by Region – Alaska, 2004

Region	*S. pneumoniae* n (rate*)	*H. influenzae* n (rate*)	*N. meningitidis* n (rate*)	Group A *Strep* n (rate*)	Group B *Strep* n (rate*)
Anchorage	69 (16.0)	8 (1.9)	5 (1.2)	17 (3.9)	21 (4.9)
Arctic Slope	1 (16.5)	0 (0)	0 (0)	1 (16.5)	2 (32.9)
Bristol Bay	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Interior	9 (9.2)	0 (0)	0 (0)	1 (1.0)	5 (5.1)
Kotzebue	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Norton Sound	2 (21.3)	0 (0)	0 (0)	2 (21.3)	0 (0)
Southeast	7 (9.9)	0 (0)	0 (0)	1 (1.4)	6 (8.5)
YK Delta	12 (48.7)	4 (16.2)	0 (0)	4 (16.2)	0 (0)
Total	100 (15.3)	12 (1.8)	5 (0.8)	26 (4.0)	34 (5.2)

*Cases per 100,000

Introduction

AIP conducts statewide surveillance of invasive *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, and groups A and B *Streptococcus*. This program is part of a passive, laboratory-based surveillance system in which laboratories from all hospitals throughout the state are encouraged to participate. The population included in the AIP surveillance is the State of Alaska, which totaled 655,435 persons in 2004 [1]. Case detection occurs year-round as participating laboratories send isolates recovered from sterile sites to the AIP lab in Anchorage, accompanied by basic demographic and clinical information on the cases. Materials and forms for isolate shipment and data collection are provided to each lab by AIP. At year-end, AIP asks that each laboratory review their records and provide information on any cases that may have been overlooked. In 2004, 23 labs in Alaska participated in the invasive disease surveillance system, either by sending isolates to the AIP lab throughout the year, conducting year-end record reviews, or both.

AIP defines a case of invasive *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, or groups A and B *Streptococcus* as an isolate of the bacteria from a normally sterile site, including blood, cerebrospinal fluid, pleural fluid, peritoneal fluid or joint fluid that has been taken from a resident of Alaska. In addition, for group A streptococcus, isolates are requested from deep tissue infections such as might be collected from surgical debridement of cases of necrotizing fasciitis.

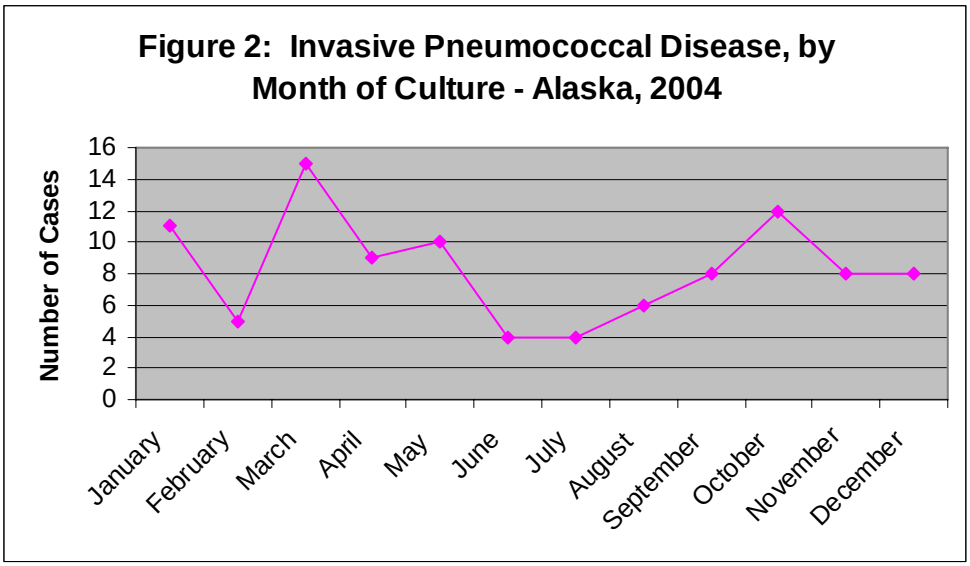
Invasive Pneumococcal Disease

Overall Incidence

A total of 84 pneumococcal isolates were received at AIP in 2004. An additional 16 cases were detected through year-end follow up with participating labs throughout the state for a total of 100 cases of invasive pneumococcal disease. The overall invasive pneumococcal case rate for 2004 was 15.3 per 100,000 persons per year. Alaska rates for 2004 were higher than the Active Bacterial Core Surveillance (ABCs) 2004 national projected rate of 13.8/100,000 [2]. ABCs is a surveillance system operated in 9 states which covers a population of over 38 million persons.

Seasonality

Invasive *Streptococcus pneumoniae* cases were identified in each month of 2004. The largest number of cases was reported in March.



Race

In 2004, the state population was comprised of 19% Alaska Natives *(Alaska Natives 127,008, non-Natives 528,427)* [1]. The percentage of all reported *S. pneumoniae* cases that occurred in 2004 among Alaska Natives was 46%; for a total of 46 cases resulting in an age-adjusted rate of 35.1/100,000 persons per year. Fifty-four cases occurred among the non-Native population for an age-adjusted rate of 9.5/100,000 persons per year. The rate ratio of age-adjusted rates of *S. pneumoniae* disease for the Alaska Native population compared with the non-Native population in 2004 is 3.7.

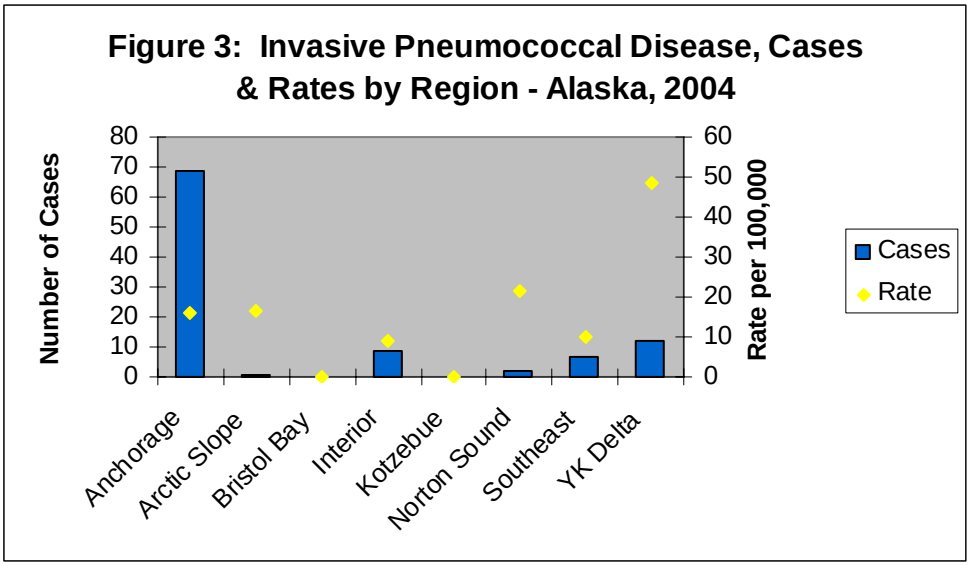
Table 2: Invasive *Streptococcus pneumoniae* Cases by Race – Alaska, 2004

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)
Alaska Native	46 (46)	35.1	43.5	4 (8.9)‡
Non-Native†	54 (54)	9.5	51.9	12 (23)‡
Total	100		48	16 (16.5)

*Cases per 100,000 per percent distribution of Alaska 2000 population
†Includes 2 cases for which race was unknown
‡Outcome unknown for 1 AK Native case, 2 Non-Native cases

Region

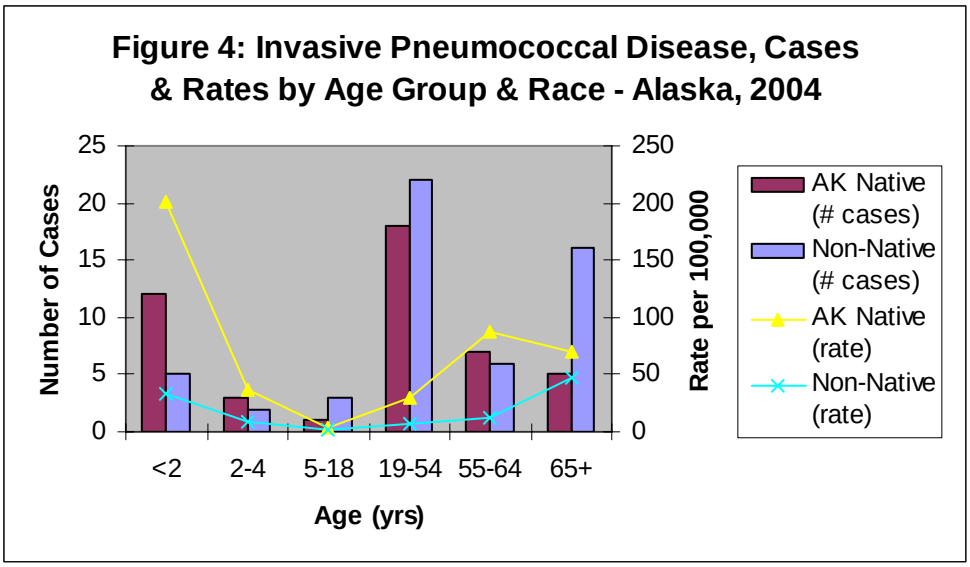
The highest percentage (69%) of invasive pneumococcal disease cases occurred in the Anchorage area in 2004. Rates of disease, however, were highest in the YK Delta, 48.7/100,000 persons per year.



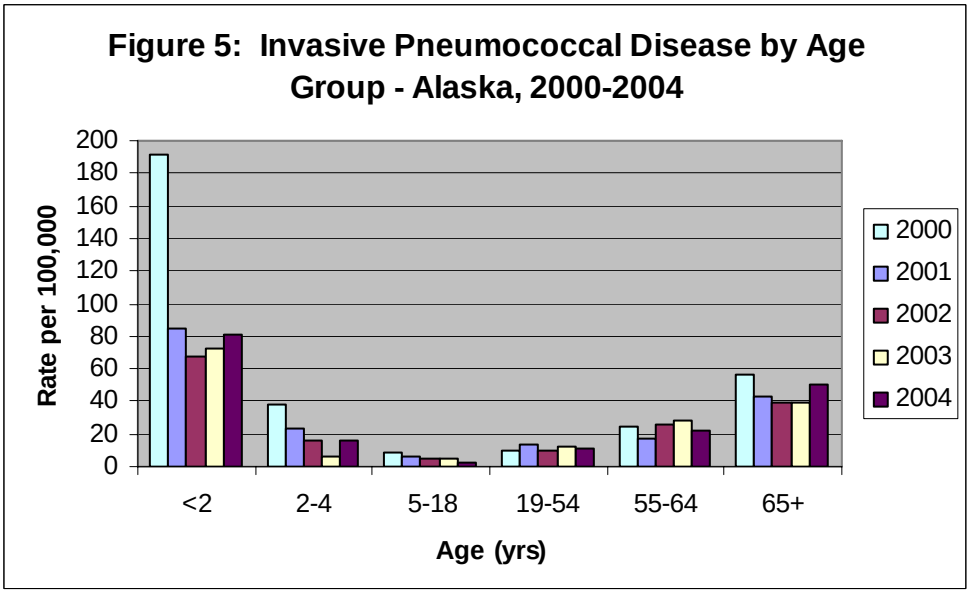
Age

Cases occurred in all age groups in 2004 ranging from 0.2 years to 98.1 years with a median of 46.6 years. Overall, the highest rates of disease occurred in children less than 2 years old.

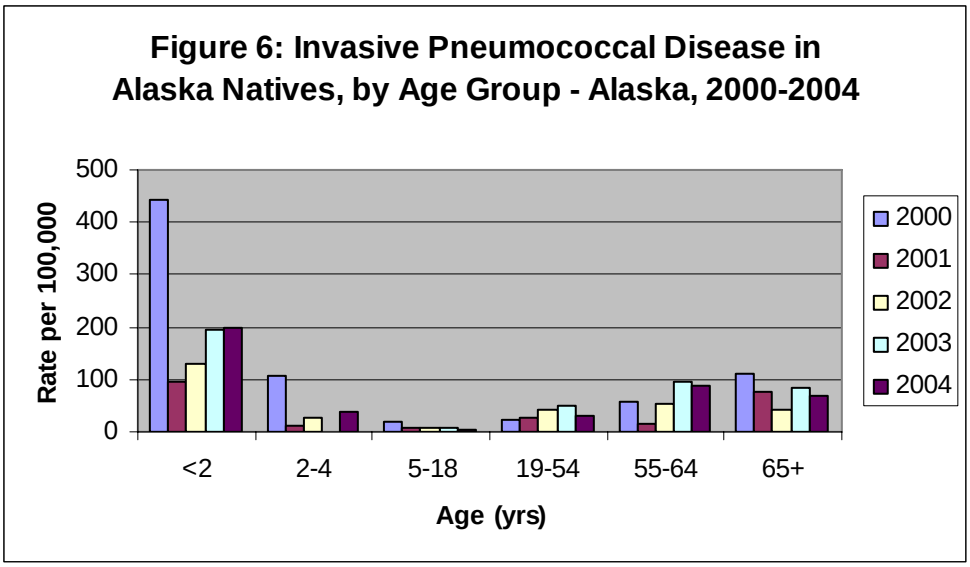
When stratified by age and race, the highest rates of disease in 2004 occurred in Alaska Native children less than 2 years old (200.2/100,000 persons per year).

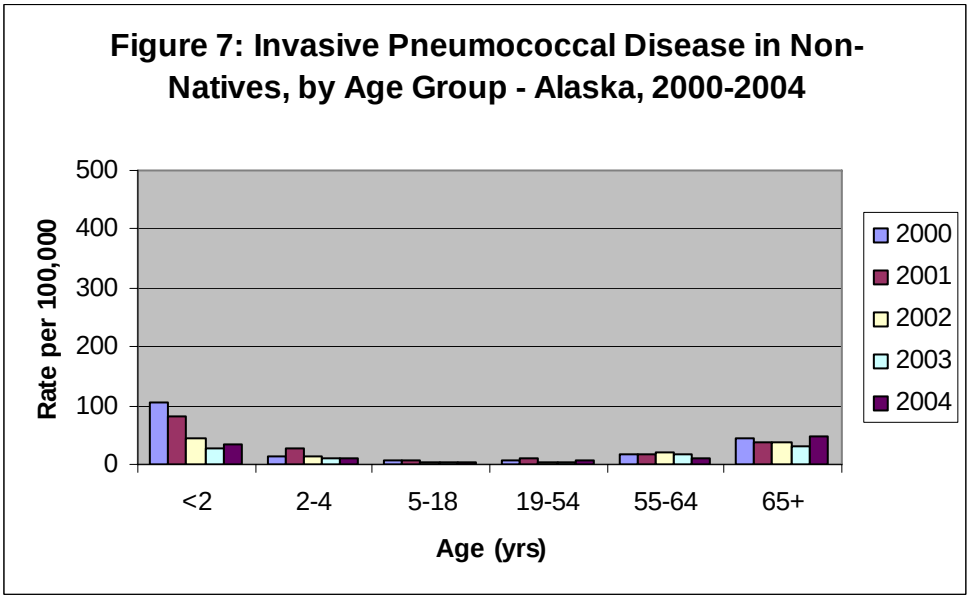


Since the initiation of a pneumococcal conjugate vaccine program in 2001, overall rates of invasive disease have declined dramatically in children less than 2 years of age [3]. In 2000, overall yearly rates of pneumococcal disease in children less than 2 years were 191.2/100,000, dropping to a low of 67.9/100,000 in 2002 and then increasing to 81.3/100,000 in 2004.



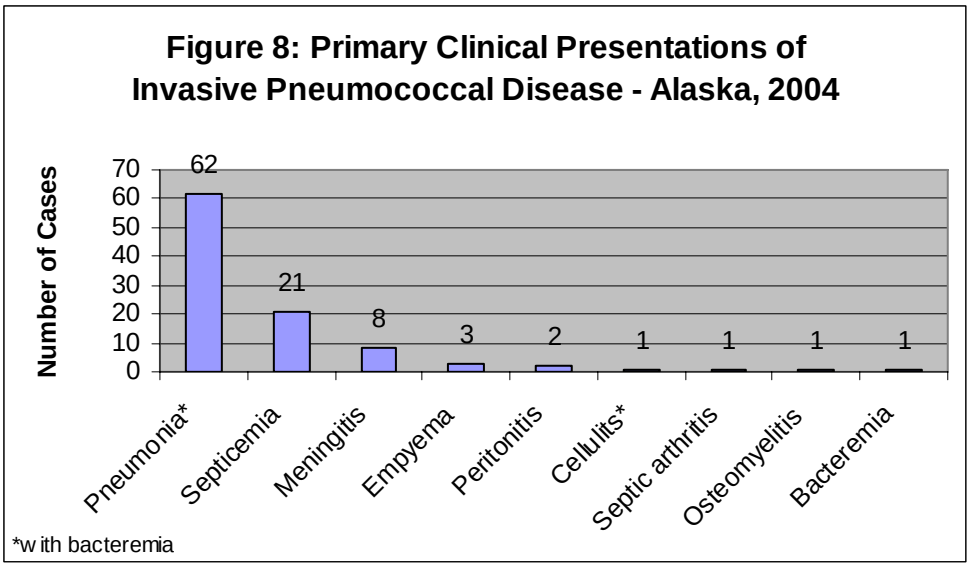
Although pneumococcal disease rates dropped initially in AK Native and non-Native children less than 2 years after 2000, the rates of disease in AK Native children less than 2 years have been trending upward from a low of 93.6/100,000 in 2001 to 200.2/100,000 in 2004. Rates of invasive disease in non-Native children less than 2 years have continued to decline during the same time period, however, there has been a slight increase from a low of 26.9/100,000 in 2003 to 33.5/100,000 in 2004.





Clinical Presentation

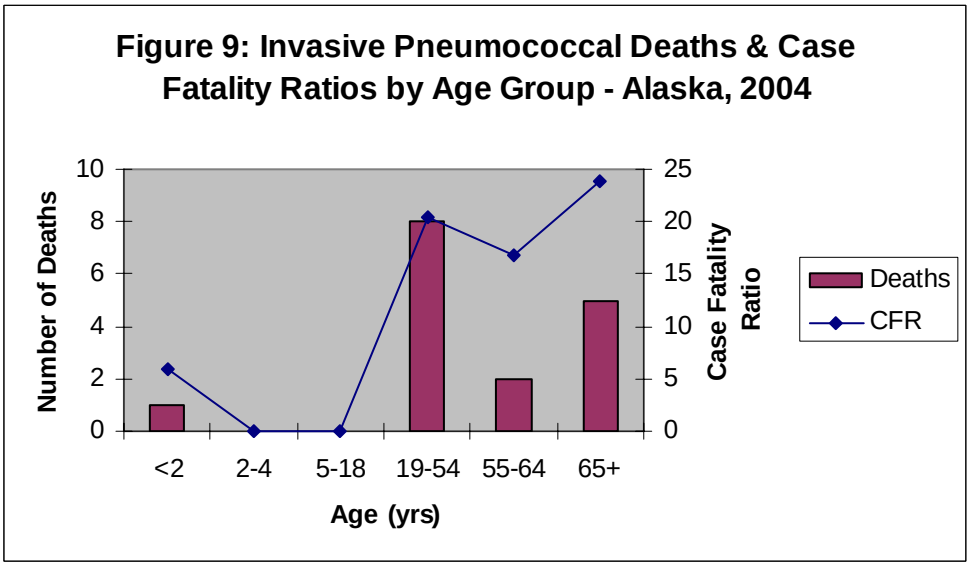
The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the pneumococcal infection was recorded as the primary clinical presentation. Pneumonia with bacteremia was the most common primary clinical presentation in 2004 (62%) followed by septicemia (21%). Seven cases had a secondary pneumococcal-related diagnosis in 2004; 5 pneumonia and 1 each cellulitis with bacteremia and hemolytic uremic syndrome.



In 2004, blood was the most common source of a positive culture which was used to identify 90 (90%) of 100 cases. Cerebrospinal fluid was the positive site for 7% of cases and 1 case each was identified through pleural fluid, peritoneal fluid and an autopsy cerebrospinal fluid sample.

Mortality

In 2004, the overall case fatality ratio for *S. pneumoniae* in Alaska was 16.5% (16 deaths out of 97 cases for which outcome was known). The case fatality ratio for non-Natives was higher than Natives; 23% (12 deaths) and 8.9% (4 deaths), respectively. Although the majority of deaths occurred in the 19-54 year old age category (8 deaths), the highest case fatality ratio occurred in the 65+ age category; 23.8% (5 deaths).



Serotype

Serotyping of invasive pneumococcal isolates is performed at AIP using internationally standardized methods. Serotype identification is based on the organism's polysaccharide capsule which is a principal virulence factor for pneumococci. This information provides a way to subtype organisms and to determine if the infection was due to a type that could be prevented by use of one of the two available pneumococcal vaccine types. Serotyping was performed on all of the *S. pneumoniae* cases for which an isolate was available.

Table 3: Invasive Pneumococcal Serotype Distribution by Race and Age Group – Alaska, 2004

		Alaska Native				Non-Native				Unknown
Serotype	Total n (%)	<2	2-18	19-64	65+	<2	2-18	19-64	65+	All Ages
03	6 (7.1)	-	-	1	1	-	-	2	1	1
04	6 (7.1)	-	-	3	-	-	1	1	1	-
06A	1 (1.2)	1	-	-	-	-	-	-	-	-
06B	1 (1.2)	-	-	-	-	1	-	-	-	-
07C	2 (2.4)	-	-	-	-	-	-	1	1	-
07F	6 (7.1)	1	2	3	-	-	-	-	-	-
08	4 (4.8)	-	-	2	-	-	-	2	-	-
09N	4 (4.8)	-	-	1	-	-	-	1	1	-
09V	1 (1.2)	-	-	-	-	-	-	1	-	-
10A	2 (2.4)	-	1	-	-	-	-	-	1	-
11A	4 (4.8)	-	-	2	-	-	-	2	-	-
12F	6 (7.1)	1	-	4	-	-	-	1	-	-
14	1 (1.2)	-	-	-	-	-	-	1	-	-
15B	3 (3.6)	1	-	-	-	-	-	2	-	-
15B/15C	1 (1.2)	1	-	-	-	-	-	-	-	-
15C	1 (1.2)	-	-	-	-	-	-	1	-	-
16F	1 (1.2)	-	-	-	-	-	-	-	1	-
17F	2 (2.4)	1	-	-	1	-	-	-	-	-
19A	15 (17.9)	3	1	2	1	2	1	3	2	1
20	1 (1.2)	-	-	1	-	-	-	-	-	-
22A	1 (1.2)	1	-	-	-	-	-	-	-	-
22F	6 (7.1)	1	-	-	1	-	1	1	2	-
23A	2 (2.4)	-	-	-	-	-	-	2	-	-
23B	1 (1.2)	-	-	-	-	-	-	-	-	-
23F	1 (1.2)	-	-	-	-	-	-	1	-	-
33F	2 (2.4)	1	-	-	-	-	-	1	-	-
34	1 (1.2)	-	-	1	-	-	-	-	-	-
35B	1 (1.2)	-	-	-	-	-	-	-	1	-
37	1 (1.2)	-	-	-	-	-	1	-	-	-
Total	84	12	4	20	4	3	4	23	12	2

In 2004, the most common pneumococcal serotype was 19A (15 isolates, 17.9%). From 1986 through 2001, serotype 14 was the most common invasive pneumococcal serotype ranging from 7.4% to 23.5% of isolates. Following introduction in 2001 of the pneumococcal conjugate vaccine which includes serotype 14, the proportion of serotype 14 isolates has dropped to 1.2% in 2004. However, disease caused by serotype 19A, which is not included in the conjugate vaccine, increased. Prior to 2003, yearly numbers of cases of serotype 19A disease and the proportion of total isolates have ranged from 2 to 7 and 1.6% to 6.1%, respectively. Although the majority of serotype 19A disease occurred in AK Natives during 2003, in 2004 cases were equally distributed between AK Natives and non-Natives. The majority (80%) of serotype 19A cases occurred in the Anchorage area.

Table 4: Invasive Pneumococcal Serotype Distribution by Region – Alaska, 2004

Serotype	Anchorage	Arctic Slope	Interior	Norton Sound	Southeast	YK Delta
03	3	-	1	-	2	-
04	4	-	2	-	-	-
06A	-	-	-	-	-	1
06B	1	-	-	-	-	-
07C	1	-	1	-	-	-
07F	3	-	-	-	-	3
08	3	-	-	-	-	1
09N	3	-	-	-	1	-
09V	1	-	-	-	-	-
10A	-	-	1	-	-	1
11A	2	-	1	-	1	-
12F	4	-	-	2	-	-
14	1	-	-	-	-	-
15B	-	1	-	-	-	-
15B/15C	1	-	-	-	-	-
15C	1	-	-	-	-	-
16F	1	-	-	-	-	-
17F	1	-	-	-	-	1
19A	12	-	-	-	1	2
20	-	-	-	-	-	1
22A	-	-	-	-	-	1
22F	3	-	2	-	1	-
23A	1	-	1	-	-	-
23B	1	-	-	-	-	-
23F	1	-	-	-	-	-
33F	1	-	-	-	1	-
34	-	-	-	-	-	1
35B	1	-	-	-	-	-
37	1	-	-	-	-	-
Total	53	1	9	2	7	12

Vaccine Serotypes

Two vaccine types are licensed for prevention of pneumococcal disease. In 2001, the pneumococcal conjugate vaccine (PCV7) was included in the Alaska childhood vaccination schedule. This vaccine provides protection against the 7 most common pneumococcal serotypes causing invasive disease

among children (types 4, 6B, 9V, 14, 18C, 19F, 23F). The table below shows the proportion of invasive infections from 2004 that were due to serotypes found in the PCV7 vaccine.

Table 5: Proportion of Invasive Isolates Contained in the PCV7 Vaccine by Age Group and Race – Alaska, 2004

Age (yrs)	Alaska Native (%)	Non-Native (%)	Total (%)
<2	0 (0%) of 12	1 (25%) of 4	1 (6%) of 16
2-4	0 (0%) of 3	0 (0%) of 1	0 (0%) of 4
5+	3 (12%) of 25	6 (15%) of 39	9 (14%) of 64
Total	3 (8%) of 40	7 (16%) of 44	10 (12%) of 84

The 23-valent polysaccharide vaccine (Ps23V) is recommended in Alaska for all persons 55 years and older, and for persons over age 2 who are at higher risk for pneumococcal disease. Revaccination is recommended after 6 years [4]. In 2004, for persons 55 years and older, 24 (80%) of 30 cases serotyped were potentially vaccine preventable invasive pneumococcal illnesses.

Potentially Preventable Deaths

In 2004, pneumococcal vaccine status was known for 65 (65%) of the 100 cases; 42 cases (42%) did receive a pneumococcal vaccine prior to illness and 23 cases (23%) had no record of a pneumococcal vaccine.

A PCV7 vaccine failure is defined as invasive pneumococcal disease caused by a serotype contained in the PCV7 vaccine in a child less than five years old who has had at least two doses of vaccine. There were no vaccine failures in 2004.

Two of the 16 deaths in 2004 from invasive *S. pneumoniae* occurred from serotypes contained within the Ps23V vaccine (03 and 04) in vaccinated individuals. Time since vaccination was 2 years and 8 years, respectively.

Table 6: Invasive Pneumococcal Disease, Serotypes of Fatal Cases – Alaska, 2004

Serotype	Deaths (%)	Frequency (n)
03†	2 (33)	6
04*†	1 (17)	6
07C	1 (50)	2
09N†	2 (50)	4
10A†	1 (50)	2
11A†	1 (25)	4
12F†	1 (17)	6
15B†	1 (33)	3
22F†	2 (33)	6
23A	1 (50)	2
23F*†	1 (100)	1

*Serotypes contained in the PCV7 vaccine
†Serotypes contained in the 23-valent polysaccharide vaccine

Overall, 75% of all pneumococcal-related mortality in 2004 was potentially preventable with the use of the 23-valent polysaccharide vaccine in persons over 2 years old.

Table 7: Potentially Vaccine Preventable Invasive Pneumococcal Deaths – Alaska, 2004

	< 2 years	2-4	5-18	19-54	55-64	65+	Total
PCV7	0	0	0	1 (13%)	1 (50%)	0	2 (13%)
Ps23V	0	0	0	7 (88%)	1 (50%)	4 (80%)	12 (75%)
Total	1	0	0	8	2	5	16

Associated Medical Conditions

The presence of one or more associated medical conditions was reported in 82% of invasive pneumococcal cases in 2004. Cigarette smoking was the most prevalent risk factor observed in adults followed closely by alcohol abuse.

Table 8: Associated Medical Conditions Identified in Invasive Pneumococcal Cases – Alaska, 2004*

Medical Condition	Adult Cases (≥ 18 years) n=74, Cases (%)
Cigarette smoking	32 (43)
Alcohol abuse	29 (39)
Chronic lung disease	18 (24)
Diabetes	12 (16)
Immunosuppressive treatment	5 (7)
Injection drug use	4 (5)
Asplenia	3 (4)

*More than one risk factor was identified in several cases

Antibiotic Resistance

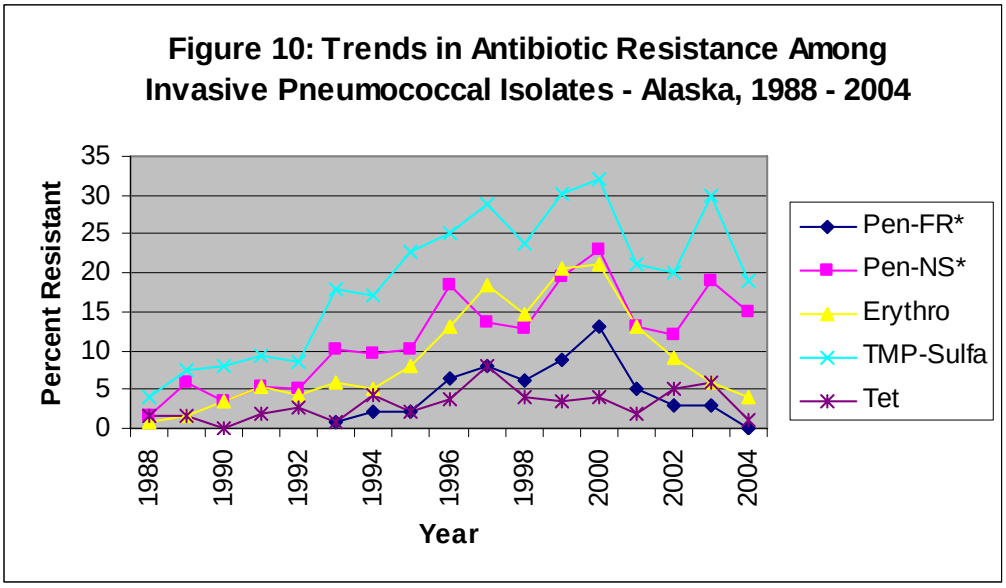
Susceptibility testing was performed on all isolates received in 2004. Results of the testing are presented in the following table.

Table 9: Antibiotic Resistance in Invasive *Streptococcus pneumoniae* Isolates – Alaska, 2004

Antibiotic	Susceptible	Intermediate	Resistant	I + R	Total Tested
Penicillin	71 (85%)	13 (15%)	0 (0%)	13 (15%)	84
TMP-sulfa	68 (81%)	9 (11%)	7 (8%)	16 (19%)	84
Erythromycin	81 (96%)	0 (0%)	3 (4%)	3 (4%)	84
Ceftriaxone	84 (100%)	0 (0%)	0 (0%)	0 (0%)	84
Tetracycline	82 (99%)	1 (1%)	0 (0%)	1 (1%)	83
Chloramphenicol	84 (100%)	0 (0%)	0 (0%)	0 (0%)	84
Rifampin	84 (100%)	0 (0%)	0 (0%)	0 (0%)	84
Vancomycin	84 (100%)	0 (0%)	0 (0%)	0 (0%)	84
Levoflox	84 (100%)	0 (0%)	0 (0%)	0 (0%)	84
Clindamycin	84 (100%)	0 (0%)	0 (0%)	0 (0%)	84

Cut points from the Minimum Inhibitory Concentration (MIC) Interpretive Standards were used to determine if an isolate was 'susceptible', 'intermediate', or 'resistant' to the antibiotic being tested [5]. The MIC Interpretive Standards definitions of 'susceptible', 'intermediate', and 'resistant' can be found in the Appendix.

Serotypes found in the PCV7 vaccine are more likely to be non-susceptible to penicillin and erythromycin than non-vaccine serotypes. One potential benefit of the use of this vaccine was an anticipated decline in antibiotic resistance among circulating pneumococci. The data in the following graph supports this assumption; since the initiation of the PCV7 vaccine in 2001, antibiotic resistance among invasive pneumococci has dropped. During 2003, TMP-sulfa and penicillin resistance increased, however, both decreased in 2004 to similar levels of resistance seen in 2002.



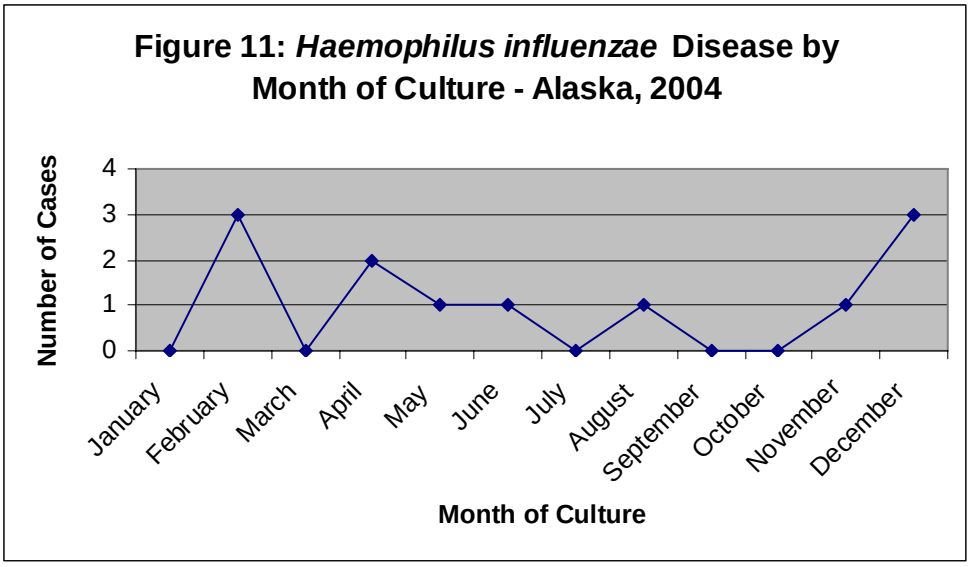
*Pen-FR = fully resistant, Pen-NS = non-susceptible

Invasive *Haemophilus influenzae*

Overall Incidence

In 2004, there were 12 cases of invasive *Haemophilus influenzae* in Alaska, for a statewide rate of 1.8/100,000 persons per year. This rate is similar to the national projected rate of 1.4/100,000 persons per year [6]. There were no deaths caused by *Haemophilus influenzae* in 2004.

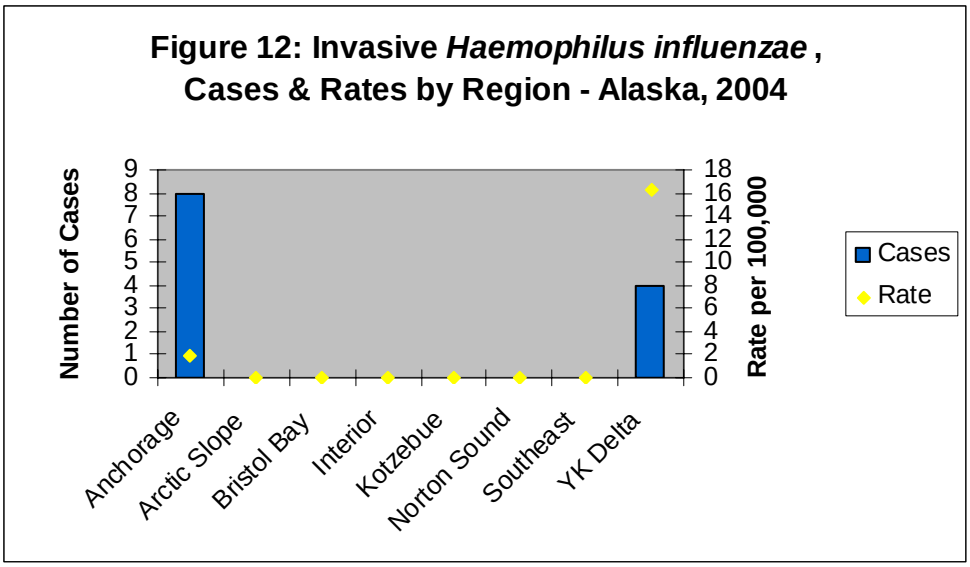
Seasonality



Due to the small number of cases, trends in seasonality cannot be determined, however, cases occurred in all seasons.

Region

The Anchorage area had the highest proportion of invasive *Haemophilus influenzae* cases in 2004 (8 cases, 67%). The Yukon-Kuskokwim Delta area, however, had the highest disease rate of 16.2/100,000 persons per year. No cases were reported in any other region of Alaska in 2004.



Race

Table 10: Invasive *Haemophilus influenzae* Cases by Race – Alaska, 2004

Race	Cases n (%)	Age Adjusted Rate *	% Male	Deaths n (%)
Alaska Native	4 (33)	2.9	75	0 (0)
Non-Native	8 (67)	1.4	50	0 (0)
Total	12		58	0 (0)

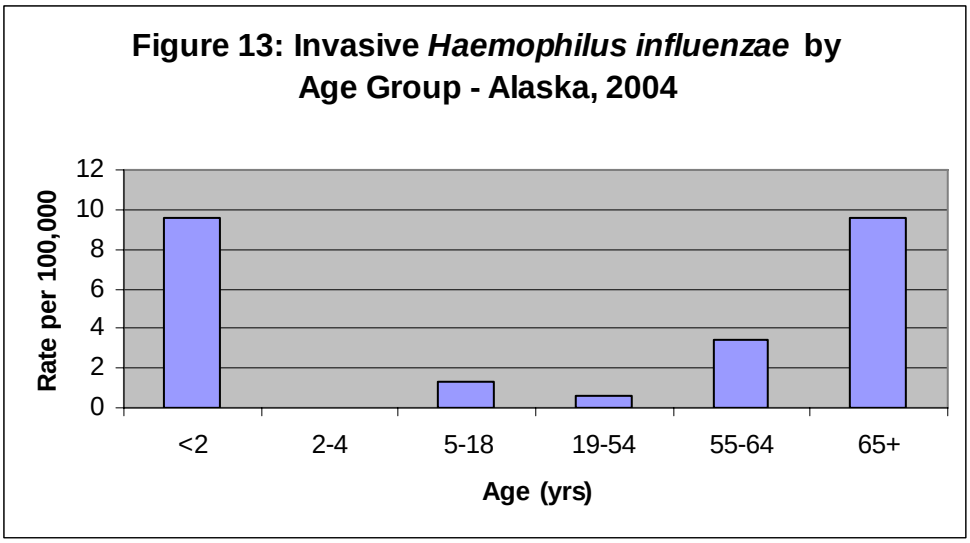
*Cases per 100,000 per percent distribution of Alaska 2000 population

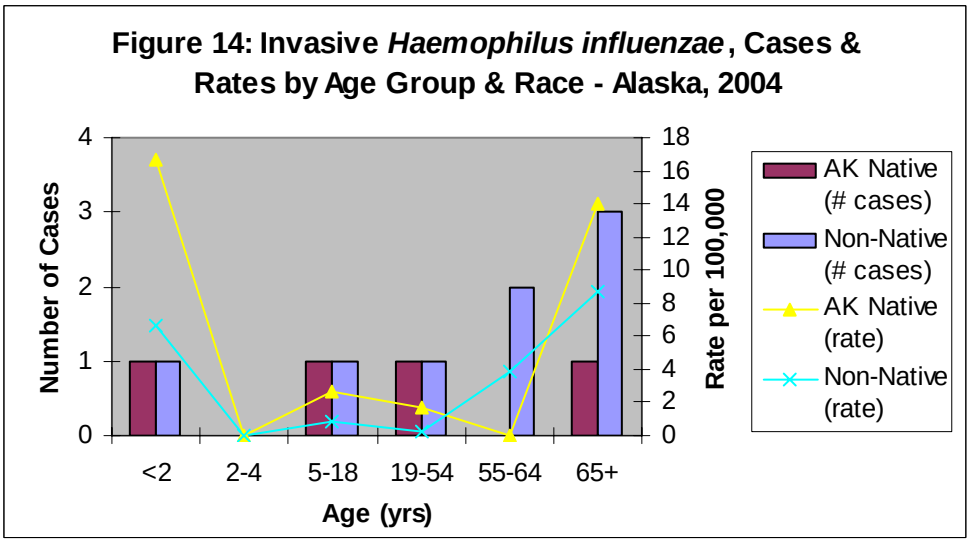
In 2004, 67% of the cases occurred in non-Natives. Age-adjusted rates were calculated for Alaska Natives and non-Natives. The age-adjusted rate ratio of *H. influenzae* disease for the Alaska Native population compared with the non-Native population in 2004 was 2.1.

Age

Haemophilus influenzae cases ranged in age from less than 6 months to 91 years of age in 2004 (median 54.3 years). Overall, the highest rates of disease occurred in children less than 2 years old and in adults greater than 65 years old.

Rates of disease in Alaska Native versus non-Native populations by age group were variable; overall numbers of cases and rates by race and age group are presented in Figure 14. The highest rates of disease occurred in Alaska Native children less than two years of age (16.7/100,000 persons per year) and adults greater than 65 years old (14/100,000 persons per year). There were no cases of *Haemophilus influenzae* in non-Native or AK Native children 2 to 4 years old. In adult age categories, there were no *H. influenzae* cases reported in AK Natives 55-64 years old.





Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. For cases with more than one diagnosis, the most serious *Haemophilus influenzae*-related diagnosis was recorded as the primary clinical presentation. In 2004, three cases had a secondary *Haemophilus influenzae*-related diagnosis; 2 cases with pneumonia and one case with an unspecified other diagnosis.

Haemophilus influenzae was isolated from 8 (67%) blood samples, 3 (25%) cerebrospinal fluid samples and 1 (8%) tracheal aspirate.

Table 11: Primary Clinical Presentation of Invasive *Haemophilus influenzae* - Alaska, 2004

Primary Presentation	n (%)
Pneumonia*	5 (42)
Meningitis	3 (25)
Septicemia	2 (17)
Peritonitis	1 (8)
Empyema	1 (8)
Total	12

*with bacteremia

Serotypes

All isolates received at AIP are serotyped. The bacterial capsule is the basis for serotyping and is the primary virulence factor. Serotype b has been the most common serotype in the past, but its prevalence has decreased with use of the childhood Hib vaccine. Surveillance of serotypes is important for monitoring vaccine effectiveness and emergence of non-vaccine serotypes.

Table 12: Serotypes of Invasive *Haemophilus influenzae* Cases by Race – Alaska, 2004

		Alaska Native				Non-Native			
Serotype	Total n (%)	<2	2-18	19-64	65+	<2	2-18	19-64	65+
b	2 (18)	1	0	0	0	0	0	1	0
f	4 (36)	0	1	0	0	0	1	1	1
NT*	5 (45)	0	0	1	0	1	0	1	2
Total	11†	1	1	1	0	1	1	3	3

*Non-typable
†One case not serotyped

Hib

In recent years, the prevalence of *Haemophilus influenzae* type b has declined due to increased use of a childhood vaccine against this serotype. Two cases of Hib occurred in 2004; one in a 4 month old male AK Native and one in a 60 year old non-Native male. The 4 month old male had received two doses of PedVaxHib vaccine (2 and 4 months) and presented with meningitis 11 days after the second vaccine dose. The overall Hib rate for 2004 was 0.3/100,000 persons per year; for children less than 2 years, the rate was 4.9/100,000.

Antibiotic Resistance

The 11 *Haemophilus influenzae* isolates received at AIP were tested for susceptibility to ampicillin, chloramphenicol, ceftriaxone and TMP/sulfa. All 11 isolates were susceptible to chloramphenicol and ceftriaxone; 2 isolates were fully resistant to ampicillin and the remaining 9 were susceptible;1 isolate was fully resistance to TMP/sulfa and the remaining 10 were susceptible.

Table 13: Summary of Invasive *Haemophilus influenzae* Case Characteristics, Alaska, 2004

Sex	Age (Yrs)	Race	Residence	Site of Isolation	Clinical Presentation(s)	Serotype*	Associated Medical Conditions	Survived
M	0.4	AK Native	Other	CSF	Meningitis	B	Chronic lung disease	Yes
F	0.4	Non-Native	Anchorage	Aspirate	Pneumonia	NT	None	Yes
M	9.5	Non-Native	Anchorage	Blood	Peritonitis	F	None	Yes
M	11.6	AK Native	Anchorage	Blood	Pneumonia	F	Chronic lung disease	Yes
M	20.9	AK Native	Other	Blood	Septicemia	NT	Cigarette smoking	Yes
M	48.4	Non-Native	Other	Blood	Pneumonia	NT	Cigarette smoking, chronic lung disease, alcohol abuse	Yes
M	60.3	Non-Native	Other	Blood	Pneumonia	B	Chronic lung disease	Yes
M	60.8	Non-Native	Anchorage	Blood	Empyema, pneumonia	F	None	Yes
F	69.5	Non-Native	Anchorage	CSF	Meningitis	NT	None	Yes
F	71.3	Non-Native	Anchorage	CSF	Meningitis, pneumonia	F	Diabetes	Yes
F	72.2	Non-Native	Anchorage	Blood	Septicemia	NT	Chronic lung disease, immune suppressive treatement	Yes
F	91.4	AK Native	Anchorage	Blood	Pneumonia	†	Chronic lung disease	Yes

*NT = non-typeable
†Isolate not received for serotyping

Invasive *Neisseria meningitidis*

Overall Incidence

A total of 5 cases of invasive *Neisseria meningitidis* were reported to AIP in 2004 for an overall rate of 0.8/100,000. The Alaska rates are similar to the ABCs 2004 national projected rate of 0.3/100,000 [7]. There were two invasive *N. meningitidis*-related deaths in Alaska in 2004 which resulted in a case fatality ratio of 40%.

Seasonality

N. meningitidis cases occurred in January (1 case), February (2 cases), August (1 case), and September (1 case); no clusters of related cases were reported.

Race

In 2004, 80% of invasive *N. meningitidis* cases in Alaska occurred in the non-Native population for an age-adjusted rate of 0.8/100,000 persons per year compared to the Alaska Native rate of 0.6/100,000 persons per year.

Table 14: Invasive *Neisseria meningitidis* Cases by Race – Alaska, 2004

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)
Alaska Native	1 (20)	0.6	100	0 (0)
Non-Native	4 (80)	0.8	75	2 (50)
Total	5		80	2 (40)

*Cases per 100,000 per percent distribution of Alaska 2000 population

Region

All five invasive *N. meningitidis* cases in 2004 occurred in Southcentral Alaska.

Age

Invasive *N. meningitidis* cases reported in 2004 ranged in age from 0.8 to 60.9 years old; the median age was 17.3 years.

Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the *N. meningitidis* infection was recorded as the primary clinical presentation. Two cases presented with septicemia and three cases presented with meningitis.

N. meningitidis was isolated from cerebrospinal fluid samples in 3 of 5 (60%) cases in 2004. The remaining two cases were isolated from blood.

Mortality

There were two *N. meningitidis*-related deaths reported in Alaska in 2004. One death occurred in a 20.2 year old non-Native male who presented with meningitis and had a history of alcohol abuse. The second death occurred in a 60.9 year old non-Native male who presented with septicemia and was a cigarette smoker.

Serogroup

All five invasive *N. meningitidis* cases in 2004 were serogrouped; all five were serogroup B.

Table 15: Summary of Invasive *Neisseria Meningitidis* Cases Characteristics, Alaska, 2004

Sex	Age (yrs)	Race	Residence	Site of Isolation	Clinical Presentation(s)	Associated Medical Conditions	Survived
M	0.8	AK Native	Anchorage	CSF	Meningitis	None	Yes
M	4.5	Non-Native	Anchorage	Blood	Septicemia	None	Yes
F	17.3	Non-Native	Anchorage	CSF	Meningitis	Cigarette smoking	Yes
M	20.2	Non-Native	Anchorage	CSF	Meningitis	Alcohol abuse	No
M	60.9	Non-Native	Anchorage	Blood	Septicemia	Cigarette smoking	No

Invasive group A *Streptococcus*

Overall Incidence

A total of 26 cases of invasive group A *Streptococcus* (GAS) were reported to AIP in 2004. The overall rate of invasive GAS disease in the state of Alaska was 4/100,000 persons per year. The Alaska rate is slightly higher than the ABCs 2004 national projected rate of 3.3/100,000 [8]. In 2004, there were 2 GAS-related deaths for a case fatality ratio of 8%.

Seasonality

Cases of group A *Streptococcus* occurred throughout the year in 2004 with no apparent trends in seasonality.

Race

In 2004, 54% of invasive GAS cases in Alaska occurred in the Alaska Native population for an age-adjusted rate of 11/100,000 persons per year which was over four times higher the non-Native age-adjusted rate of 2.3/100,000 persons per year and over twice the 2003 age-adjusted rate for Alaska Natives (5/100,000 persons).

Table 16: Invasive group A *Streptococcus* Cases by Race – Alaska, 2004

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)
Alaska Native	14 (54)	11	29	1 (7)
Non-Native	12 (46)	2.3	58	1 (8)
Total	26		42	2 (8)

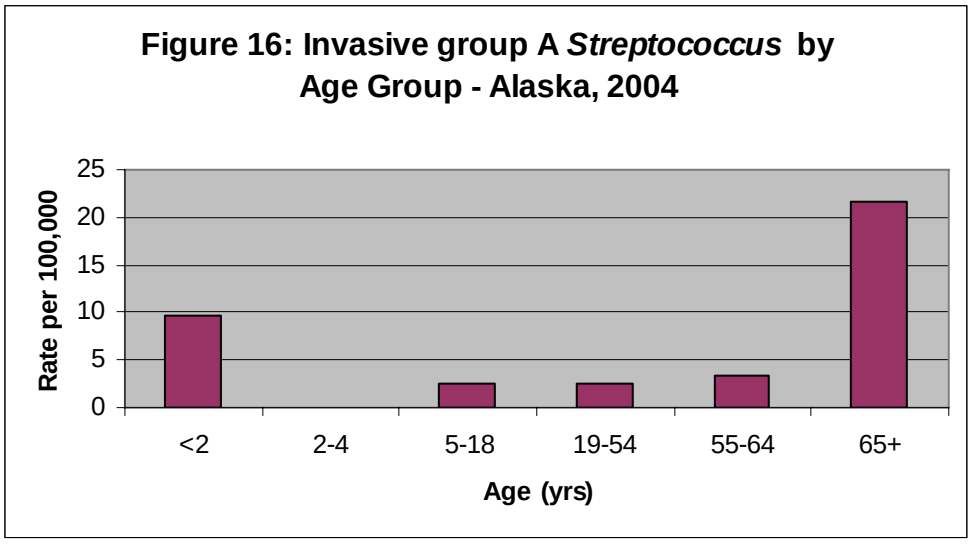
*Cases per 100,000 per percent distribution of Alaska 2000 population

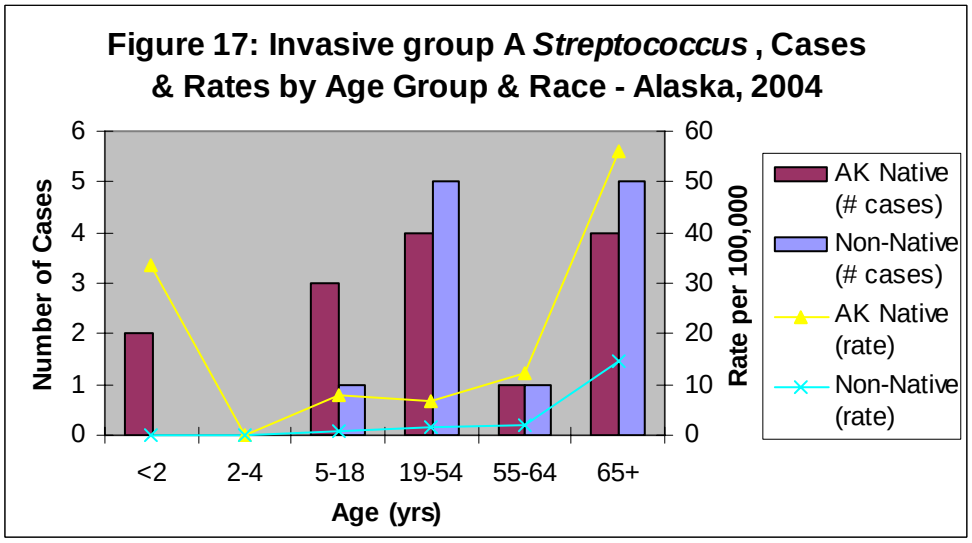
Region

Seventeen (65.4%) of the 26 invasive group A *Streptococcus* cases in 2004 were reported in the Anchorage area, 4 cases in the YK Delta, 2 cases in Norton Sound and one case each in Southeast, the Interior and the Arctic Slope regions.

Age

Invasive group A *Streptococcus* cases reported in 2004 ranged in age from 0.4 to 93.4 years old; the median age was 42.7 years. Highest rates of disease occurred persons 65 years and older (21.6/100,000).





In 2004, the highest rates of invasive group A streptococcal disease occurred in Alaska Natives less than 2 years old (33.4/100,000 persons per year) and Alaska Native adults 65 years of age

and older (56.1/100,000 persons per year). The highest GAS disease rate in the non-Native population occurred in the 65+ years age category (14.5/100,000 persons per year). No cases were reported in the AK Native or non-Native population in the 2-4 age category and no cases were reported in the non-Native population in the less than 2 age category.

Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the GAS infection was recorded as the primary clinical presentation. Table 17 shows the primary clinical presentations of invasive group A *Streptococcus* in Alaska for 2004.

Group A *Streptococcus* was isolated from blood samples in 20 (77%) of 26 cases and one each from pleural fluid, joint fluid and an unidentified other sterile site.

Table 17: Primary Clinical Presentations of Invasive group A *Streptococcus* – Alaska, 2004

Primary Presentation	n (%)
Cellulitis*	10 (38.5)
Septicemia	4 (15.4)
Pneumonia*	4 (15.4)
Septic arthritis	3 (11.5)
Empyema	1 (3.9)
Osteomyelitis	1 (3.9)
Endometritis	1 (3.9)
Bursitis	1 (3.9)
Other	1 (3.9)
Total	26

*with bacteremia

Table 18: Summary of Invasive group A *Streptococcus* Case Characteristics, Alaska, 2004

Sex	Age (yrs)	Race	Residence	Site of Isolation	Clinical Presentation(s)	Associated Medical Conditions	Survived
F	0.4	AK Native	Anchorage	Joint fluid	Osteomyelitis	None	Yes
M	0.8	AK Native	Other	Blood	Pneumonia, cellulitis, necrotizing fasciitis	None	Yes
M	11.3	Non-Native	Anchorage	Blood	Pneumonia	None	No
F	13.8	AK Native	Other	Joint fluid	Other	None	Yes
M	16.2	AK Native	Other	Blood	Cellulitis	None	Yes
F	18.3	AK Native	Other	Blood	Endometritis	None	Yes
M	24.4	Non-Native	Anchorage	Blood	Septic arthritis, cellulitis, toxic shock syndrome	Cigarette smoking	Yes
F	33.7	Non-Native	Other	Blood	Cellulitis	None	Yes
M	35.7	Non-Native	Anchorage	Joint fluid	Septic arthritis, cellulitis	None	Yes
F	37.2	AK Native	Other	Blood	Cellulitis	Cigarette smoking	Yes
M	37.4	AK Native	Anchorage	Other	Bursitis	Cigarette smoking, alcohol abuse	Yes
M	39.4	Non-Native	Anchorage	Blood	Cellulitis	Cigarette smoking	Yes
M	40.1	Non-Native	Anchorage	Joint fluid	Septic arthritis, cellulitis	None	Yes
F	45.4	AK Native	Anchorage	Pleural fluid	Empyema, pneumonia	Cigarette smoking, alcohol abuse	Yes
F	50.0	AK Native	Anchorage	Blood	Septicemia	None	Yes
F	59.1	AK Native	Other	Blood	Septicemia	Cigarette smoking, diabetes	Yes
F	63.8	Non-Native	Anchorage	Blood	Cellulitis	Diabetes	Yes
F	68.7	AK Native	Anchorage	Blood	Cellulitis	Chronic lung disease, diabetes	Yes
F	69.1	Non-Native	Other	Blood	Septicemia	None	Yes
M	69.6	AK Native	Anchorage	Blood	Septicemia	Cigarette smoking, alcohol abuse	Yes
F	75.6	AK Native	Other	Blood	Pneumonia	Cigarette smoking	No
F	82.7	Non-Native	Anchorage	Blood	Cellulitis	None	Yes
M	82.8	Non-Native	Anchorage	Blood	Cellulitis	Cigarette smoking, immune suppressive treatment	Yes
F	88.5	AK Native	Other	Blood	Cellulitis	None	Yes
F	88.8	Non-Native	Anchorage	Blood	Cellulitis	None	Yes
M	93.4	Non-Native	Anchorage	Blood	Pneumonia	None	Yes

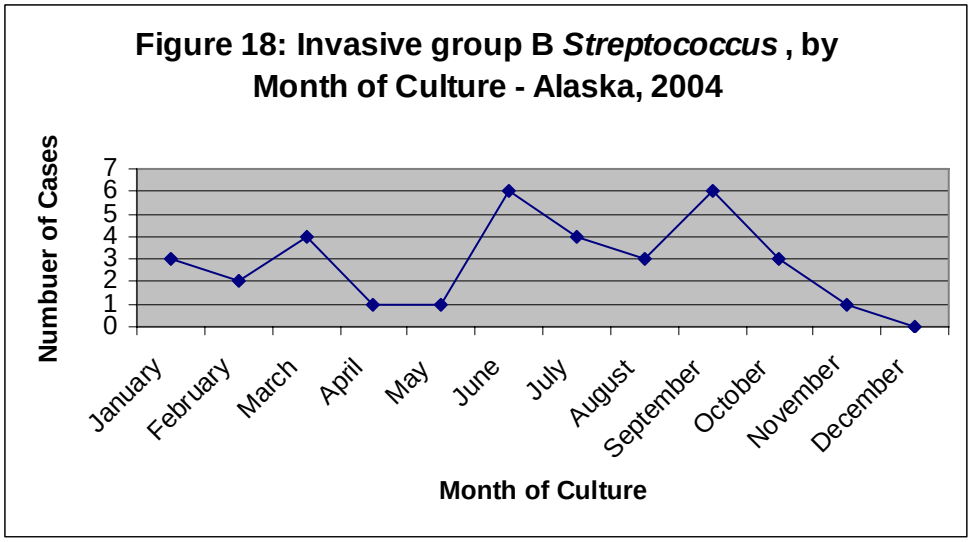
Invasive group B *Streptococcus*

Overall Incidence

A total of 34 cases of invasive group B *Streptococcus* (GBS) were reported to AIP in 2004. Overall rates of invasive GBS disease in the state of Alaska were 5.2/100,000 persons per year. The Alaska rate is lower than the ABCs 2004 national projected rate of 7.2/100,000 [9]. In 2004, there were three GBS-related deaths for a case fatality ratio of 9% (outcome was unknown in 1 case).

Seasonality

Cases of group B *Streptococcus* occurred throughout the year with no apparent trends in seasonality.



Race

In 2004, 32% of invasive group B *Streptococcus* cases in Alaska occurred in the Alaska Native population for an age-adjusted rate of 7.2/100,000 persons per year compared with the non-Native rate of 4/100,000 persons per year.

Table 19: Invasive group B *Streptococcus* Cases by Race – Alaska, 2004

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)†
Alaska Native	11 (32)	7.2	55	2 (18)
Non-Native	23 (68)‡	4	61	1 (5)
Total	34		59	3 (9)

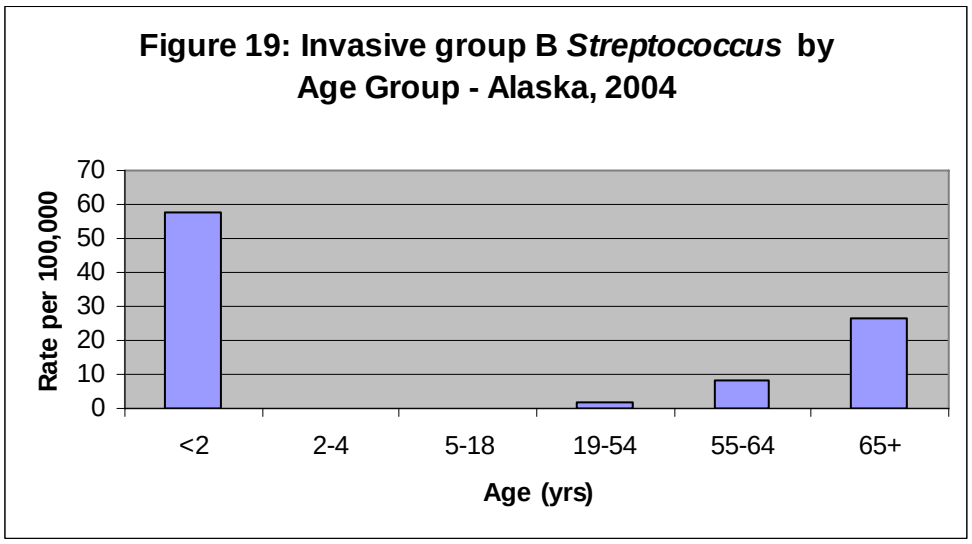
*Cases per 100,000 per percent distribution of Alaska 2000 population
†Outcome unknown in 1 non-Native case
‡Includes one case for which race was unknown

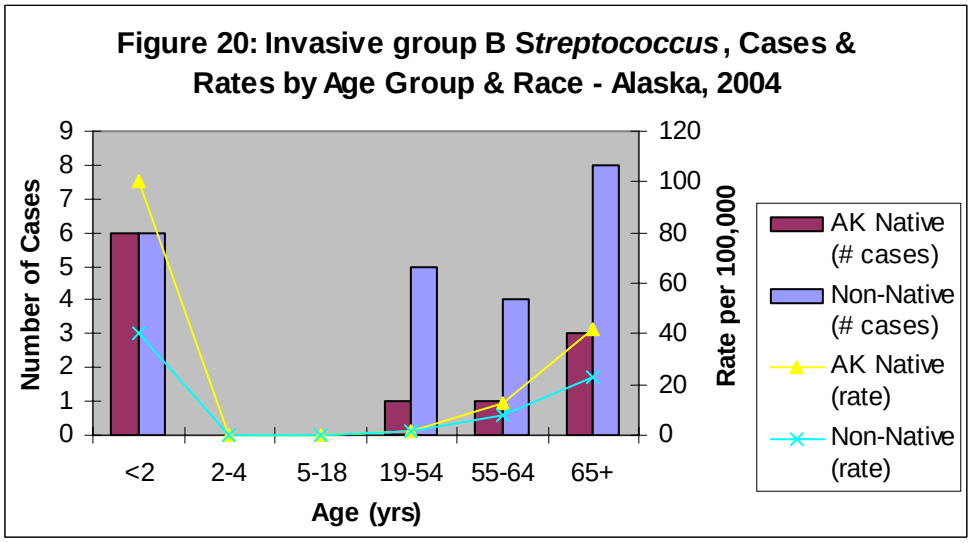
Region

In 2004, 21 of the 34 reported GBS cases occurred in Anchorage; six cases were reported in Southeast Alaska, five in the Interior and two in the Arctic Slope.

Age

Invasive group B *Streptococcus* cases reported in 2004 ranged in age from newborn to 80.1 years old; the median age was 53.9 years. Highest rates of disease occurred in children less than two years old (57.4/100,000 persons per year) and in the 65 and older age category (26.5/100,000 person per year).





The highest rates of disease occurred in AK Native children less than 2 years of age (100.1/100,000 persons per year). One of six cases that occurred in this age category was early-

onset disease (cases less than 7 days old); and comprised a rate of 0.33/1,000 births. Of the six cases that occurred in children less than 2 years old in non-Natives, two were early-onset disease for a rate of 0.27/1,000 births.

Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the GBS infection was recorded as the primary clinical presentation. In 2004, the most common clinical presentation was septicemia which occurred in 15 cases (44%). One case of endocarditis had additional presentations of osteomyelitis and cellulitis.

Group B *Streptococcus* was isolated from blood in 31 (91%) of 34 cases in 2004; two cases were isolated from cerebrospinal fluid and one from joint fluid.

Table 20: Primary Clinical Presentations of Invasive group B *Streptococcus* – Alaska, 2004

Primary Presentation	n (%)
Septicemia	15 (44)
Cellulitis*	5 (15)
Endocarditis	4 (12)
Pneumonia*	3 (9)
Meningitis	3 (9)
Bacteremia	2 (6)
Septic arthritis	1 (3)
Other	1 (3)
Total	34

*with bacteremia

Antibiotic Resistance

Susceptibility testing was performed on 28 of 29 GBS isolates received in 2004. Results of the testing are presented in the following table.

Table 21: Antibiotic Resistance in Invasive group B *Streptococcus* Isolates – Alaska, 2004

Antibiotic	Susceptible	Intermediate	Resistant	I + R	Total Tested
Penicillin	27 (100%)	0 (0%)	0 (0%)	0 (0%)	27
Cefotaxime	28 (100%)	0 (0%)	0 (0%)	0 (0%)	28
Erythromycin	10 (36%)	3 (11%)	15 (54%)	18 (65%)	28
Tetracycline	2 (7%)	0 (0%)	26 (93%)	26 (93%)	28
Levoflox	27 (96%)	0 (0%)	1 (4%)	1 (4%)	28
Clindamycin	16 (57%)	2 (7%)	10 (36%)	12 (43%)	28

All isolates tested were susceptible to penicillin and cefotaxime. Resistance to erythromycin and clindamycin, either intermediate or full, was seen in 65% and 43%, respectively, of isolates

tested. Isolates from two of the three early onset cases were tested; both showed resistance to erythromycin and tetracycline and one isolate was additionally resistant to clindamycin.

Table 21: Summary of Invasive group B *Streptococcus* Case Characteristics, Alaska, 2004

Sex	Age (yrs)	Race	Residence	Site of Isolation	Clinical Presentation(s)	Associated Medical Conditions	Survived
M	< 1 day	Non-Native	Anchorage	Blood	Septicemia	None	Unknown
F	< 1 day	AK Native	Other	Blood	Septicemia	None	Yes
M	< 1 day	Non-Native	Anchorage	Blood	Septicemia	None	Yes
F	0.1	Non-Native	Anchorage	CSF	Meningitis	None	Yes
M	0.1	AK Native	Anchorage	Blood	Septicemia	None	Yes
F	0.1	AK Native	Other	Blood	Meningitis	Chronic lung disease	Yes
M	0.1	Non-Native	Other	Blood	Septicemia	None	Yes
M	0.1	AK Native	Anchorage	Blood	Septicemia	None	Yes
M	0.2	Non-Native	Other	CSF	Meningitis	None	Yes
F	0.3	AK Native	Anchorage	Blood	Septicemia	None	Yes
M	0.3	Non-Native	Other	Blood	Septicemia	None	Yes
M	0.5	AK Native	Anchorage	Blood	Pneumonia	None	Yes
F	38	Non-Native	Anchorage	Blood	Bacteremia	Cigarette smoking, diabetes	Yes
F	47.8	Non-Native	Anchorage	Blood	Cellulitis	Diabetes	Yes
M	48.8	Non-Native	Anchorage	Blood	Endocarditis, cellulitis, osteomyelitis	Diabetes	No
F	50	Non-Native	Anchorage	Blood	Septicemia	None	Yes
M	52.7	Non-Native	Other	Blood	Endocarditis	Cigarette smoking, diabetes	Yes
M	54.9	AK Native	Other	Blood	Septicemia	None	Yes
F	56.6	Non-Native	Anchorage	Blood	Cellulitis	Immune suppressive treatment, diabetes	Yes
M	58.9	AK Native	Anchorage	Blood	Septicemia	Alcohol abuse	No
F	59.9	Non-Native	Other	Blood	Endocarditis	Diabetes	Yes
M	61.1	Non-Native	Anchorage	Blood	Septicemia	Alcohol abuse, diabetes	Yes
M	63.9	Non-Native	Anchorage	Joint fluid	Septic arthritis	None	Yes
M	65.9	AK Native	Other	Blood	Cellulitis	Diabetes	Yes
F	68.5	Non-Native	Anchorage	Blood	Cellulitis	None	Yes
F	69.1	AK Native	Anchorage	Blood	Pneumonia	Cigarette smoking, chronic lung disease, alcohol abuse	No
M	69.2	Non-Native	Anchorage	Blood	Endocarditis	None	Yes
F	71	Unknown	Other	Blood	Septicemia	None	Yes
M	71.7	Non-Native	Anchorage	Blood	Cellulitis	Alcohol abuse	Yes
M	75	Non-Native	Other	Blood	Other	Diabetes	Yes
M	77.5	Non-Native	Other	Blood	Septicemia	Diabetes	Yes
F	77.7	AK Native	Other	Blood	Bacteremia	None	Yes
M	78.9	Non-Native	Anchorage	Blood	Pneumonia	Diabetes	Yes
F	80.1	Non-Native	Anchorage	Blood	Septicemia	None	Yes

References

[1] State of Alaska, Department of Labor & Workforce Development. Retrieved 5/20/2005 from http://almis.labor.state.ak.us

[2] Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network *Streptococcus pneumoniae*, 2004 – Provisional.

[3] HennessyTW, Singleton RJ, Bulkow LR, Bruden DL, Hurlburt DA, Parks, D, Moore M, Parkinson AJ, Schuchat A, Butler JC. Impact of heptavalent pneumococcal conjugate vaccine on invasive disease; antimicrobial resistance and colonization in Alaska Natives: progress towards elimination of a health disparity. *Vaccine* 2005;23:5464-5473.

[4] State of Alaska, Department of Health & Human Services. Retrieved 7/30/2007 from http://www.epi.hss.state.ak.us/id/iz/vaxpacket/vis/vis-PneumoPoly.pdf

[5] National Committee for Clinical Laboratory Standards (NCCLS). *Performance Standards for Antimicrobial Susceptibility Testing; Fourteenth Informational Supplement.* 2004; 24(1): M100-S14.

[6] Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network *Haemophilus influenzae*, 2004 – Provisional.

[7] Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network *Neisseria meningitidis*, 2004 – Provisional.

[8] Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network group A *Streptococcus*, 2004 – Provisional.

[9] Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network group B *Streptococcus*, 2004 – Provisional.

Appendix

MIC Interpretive Standards Definitions:

NCCLS [5] provides recommended interpretive categories for various Minimum Inhibitory Concentration values (cut points) for each organism which are defined as follows:

1. Susceptible (S):

The "susceptible" category implies that an infection due to the strain may be appropriately treated with the dosage of antimicrobial agent recommended for that type of infection and infecting species, unless otherwise contraindicated.

2. Intermediate (I):

The "intermediate" category includes isolates with antimicrobial agent MICs that approach usually attainable blood and tissue levels and for which response rates may be lower than for susceptible isolates. The "intermediate" category implies clinical applicability in body sites where the drugs are physiologically concentrated (e.g., quinolones and β-lactams in urine) or when a high dosage of a drug can be used (e.g., β-lactams). The "intermediate" category also includes a buffer zone which should prevent small, uncontrolled technical factors from causing major discrepancies in interpretations, especially for drugs with a narrow pharmacotoxicity margins.

3. Resistant (R):

Resistant strains are not inhibited by the usually achievable systemic concentrations of the agent with normal dosage schedules and/or fall in the range where specific microbial resistance mechanisms are likely (e.g., β-lactamases) and clinical efficacy has not been reliable in treatment studies.